

DEPARTMENT OF FISH AND GAME

Bay-Delta and Special
Water Projects Division
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Stockton, California 95205
(209) 948-7800



July 14, 1994

Mr. Lyle Hoag
California Urban Water Agencies
455 Capitol Mall
Suite 705
Sacramento, California 95814

Dear Mr. Hoag:

The Department of Fish and Game appreciates the opportunity to review the reports you have prepared and to discuss our concerns during the April 15 meeting and the California Urban Water Agency (CUWA) -Bay Institute Workshop. The staff of the Bay-Delta and Special Water Project Division has reviewed CUWA draft reports numbers 4, 5, 6, 7 and Attachment 2 titled "Technical Comments on Proposed Water Quality Standards for the San Francisco Bay/Delta". Comments presented here will consist of reiterating our main concerns with various items in Attachment 2 and specific comments on the draft reports reviewed by our staff (see appendices 1-4). We have focused our review on those reports that analyzed or interpreted data collected by DFG as part of the Interagency Ecological Program. Since Attachment 2 was the first document we received, it has received the most scrutiny. Our review of reports 4, 5, 6 and 7 was incomplete due to other work commitments and the lack of review or comments on other reports should not be construed as having no comments. Where we have made comments, we made them only where we had a question or disagreed with an analysis procedure or the interpretation. We do agree with a number of statements and conclusions contained in these reports, but we just didn't note them as part of our review.

We strongly disagree with CUWA's contention that an X2 salinity standard at Chipps Island provides fishery benefits equal to X2 being locate farther downstream. While the Department of Fish and Game agrees that an appropriate X2 standard at Chipps Island would provide more protection during drier years than provided by D1485 outflow standards, in our professional judgement, there is clear evidence of increased benefits as X2 moves even farther downstream into Suisun Bay. Many of our technical comments are directed at CUWA's analyses and interpretations regarding this issue.

Mr. Lyle Hoag
July 14, 1994
Page Two

The meetings with your staff and consultants and the subsequent joint CUWA and Bay Institute Workshop have helped us expand the areas of agreement and better define the areas of disagreement between our respective groups. These meetings have been very beneficial in providing critical review of everyone's analytical methods and in providing a spring-board for developing new analytical approaches and interpretations. Our staff remains committed to developing the best understanding of the ecology of the estuary and its resources and to this end will cooperate with and participate in studies and analyses that furthers this commitment.

If you have any questions regarding our comments or need any information or assistance from us, please contact Chuck Armor at (209) 942-6077.

Sincerely,



Perry L. Herrgesell Ph.D.
Chief
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Enclosure

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Attachment 2. Technical comments on proposed water quality standards for the San Francisco Bay/Delta

Specific comments:

Page 7 as it relates to Appendix 1

While variability increases as X2 moves downstream, the abundance continues to increase. This is the case even if the lower confidence is followed. This point that higher abundances are predicted when X2 moves downstream of Chipps Island is scarcely mentioned. Also lacking is a rationale why the incremental increase in variability between Chipps Island and Roe Island changes the data from acceptable to unacceptable. For variance not to increase with increasing abundance would be cause for investigation.

We are still not comfortable with using the successive months of the Fall Midwater Trawl as replicate samples for statistical determination of within year variance. Factors such as mortality are occurring during the four month MWT sample period and this mortality is not constant for any given month or year.

Page 8 item B. 1) and its supporting material in Appendix 4

Figure 4-1 is used to suggest that catch can be influenced by outflow. The variable "flow" in DFG database was mistaken for delta outflow. "Flow" is actually the meter reading from the flow meter indicating the number of revolutions the flow meter made during the trawl. Thus this figure demonstrates nothing and should be disregarded.

Page 9 item B. 4) and its supporting material in Appendix 4

Figure 4-2 notes an apparent sampling bias relating to time of day. It is unclear whether this figure represents data from September-December 1980 as stated in the figure legend or September 1980 only as stated in the title. This apparent bias is an artifact of how samples were collected. Typically samples were taken near the harbor in the early morning and these sites were mostly in the lower Sacramento River where the highest delta smelt densities occur.

Page 9 item B. 6)

Abundance indices can be affected by distribution if the distribution extends significantly outside the study area. If abundance increases with outflow (as it does for some species), there may be a tendency to under estimate abundance by some survey in the higher flow years. This is the case for starry flounder and *Crangon franciscorum*. There is no evidence that this is the case for striped bass and delta smelt in the Fall MWT. The inclusion of starry flounder and *Crangon franciscorum* data from the Fall MWT raises a number of serious questions. The midwater trawl doesn't effectively sample these two species and in fact was not designed nor fished in a manner to collect these species. The data for these species was recorded for the Fall MWT, but it should not be used for anything other than the most qualitative purposes. This is the wrong gear for these species and the wrong survey. The appropriate data source would be from the Delta Outflow/San Francisco Bay Study otter trawl.

As to the question of differences between the Bay Study and the Fall MWT surveys, both surveys use the same net and fishing methods. The annual abundance indices of longfin smelt between these two studies are highly correlated ($r^2 > .95$).

Based on the above facts and our knowledge of how the samples were collected, we don't think these two examples demonstrate bias.

Page 9 item C. 1)

We are not sure what is being said here. The biologically critical period for many of the species use in EPA's X2 analysis occurs in the February through June period and this is also the proposed regulatory period. Which species critical periods are outside of the proposed regulatory period?

Page 10 item C. 3)

This issue was discussed during the CUWA-Bay Institute Workshop and is no longer an issue.

Page 10 item D

We would strongly disagree that longfin smelt has not declined and that splittail have increased. These conclusions are not supported by any of the data sets we have available. How were the indices corrected? The methods are not detailed here nor are they referenced to any supporting reports.

Page 10 item D 2) Appendix 5

This list of species contains a number for which no relationship between X2 and abundance would be expected (based on life history, nursery habitat, etc.) including chinook salmon, American shad, threadfin shad, jacksmelt, northern anchovy, topsmelt and white croaker.

Page 10 item E

See attached comments from DFG statistician, John Geibel for a discussion of non-continuous data.

Page 10 item F

Recent analysis by DFG and DWR of salvage and splittail abundance suggests this may not be the case.

Page 10

We disagree with the statement that the habitat of a majority of estuarine species is greatest under the flow conditions of 8,000 - 15,000 cfs. This is especially true if the list is confined to estuarine dependent species (eg. *Crangon franciscorum*, longfin smelt and starry flounder) and those misclassified as estuarine species are excluded (eg. threadfin shad). Regressions of abundance on outflow or X2 clearly demonstrate that abundance continues to increase at higher flows.

Page 12 item A

Another obvious conclusion from the figures in Appendix 1 is that abundances increase exponentially with outflow.

Page 12 item B

How was the "significant" increase in variability determined for X2 values of 70-75?

Page 13 item D

Those species listed in Appendix 5 are not all estuarine species, many are marine species and their inclusion in this analysis adds nothing. White sturgeon, a demersal species, would not be sampled adequately with a midwater trawl. Threadfin shad are typically a lake species and in the estuary tend to be most abundant in "quiet water" such as dead end sloughs.

Page 13 last paragraph

The list of mechanisms should also include "reduced losses to water diversion from the delta".

Page 14 item 4) and specifically Table 6-1 in Appendix 6

This table was revised following suggestions made during the DFG and CUWA meeting. The revised table (listed as Table 1 in a handout at the CUWA and Bay Institute meeting) should be made available to all who received the original material.

Page 16 item C 2)

As a matter of clarification, striped bass eggs are slightly more dense than water and are not "on the bottom". In any case the eggs aren't the issue as the egg stage lasts only about two days. Striped bass larvae can be carried out of Suisun Bay when flows are high.

Page 16 item D 1)

While we don't necessarily disagree with this statement, it would be very helpful if some of this evidence were presented for evaluation.

Page 16 item D 2)

The turbidity analysis should be limited to the winter-spring (and possibly early summer) period because during the summer and fall turbidity may be due more to significant resuspension of sediments by wind and wave action than outflow. Doing this would also keep this analysis consistent with other analyses where the time period was limited to the spring-early summer period.

A review of the plots provided shows that maximum turbidity occurs at flows from 12,000 to 28,000 cfs in area 12, 12,000 to 16,000 cfs in area 13 and 12,000 to 85,000 in area 14. High turbidity values (secchi disk values of 0.2 m were common across the full range of outflows.

Page 16 item D 3)

Where is the evidence that midwater trawl catches are greater when turbidity is high? Catches of what? Is there a general relationship? Is there a critical level? What evidence exists to demonstrate net avoidance and prey capture are tied together?

Page 17 item E 3) and Appendix 8

We have serious reservations about the methods used and the conclusions reached in this analysis. For details, see our comments on CUWA reference #5 in Appendix 3 of this letter.

Page 17 item F 1)

See comment on this analysis in the notes from the CUWA - Bay Institute Workshop. They accurately reflect thoughts on this analysis.

Page 17 item F 2) and Appendix 8

Comments for page 17 item E 3) and Appendix 8 apply here.

Page 18 item D and Appendix 8

Comments for page 17 item E 3) and Appendix 8 apply here.

Page 20 item C and Appendix 9

Comments for page 17 item F 1) apply here.

Page 20 item D

Data for marine species from the Fall MWT should not be used given their distribution and the area sampled by the Fall MWT.

This analysis would be more meaningful if the effect of X2 on a given species were weighted by each species dependence on the estuary. Since inland silversides and threadfin shad are freshwater species any adverse impacts on them would be downgraded while the effect on estuarine dependent species such as longfin smelt would be accurately portrayed.

Page 20 item E

Comments for page 17 item E 3) apply here.

Page 23 item G

The pulse of pesticides studies by USGS occurs during the first high flow event in the late winter or early spring not summer. This timing follows the early spring spraying that takes place in many of the orchards in the drainage basin.

Comments on CUWA Reference #4:

Review and evaluation of foundational literature and data related to the proposed EPA salinity standard

Summary:

We disagree with the conclusion that only a limited number of euryhaline species benefit from EPA's X2 standard and that the ecosystem or community was not considered. An entire ecosystem, consisting of species dependent on brackish areas, benefit from the proposed X2 standard. All the native euryhaline species, and striped bass, were included in EPA's justification. *Palaemon* and yellowfin goby, which are introduced, and sturgeon, which are anadromous, are the only common euryhaline species not included by EPA.

From their review of the data, the authors concluded that the changes in annual abundance indices "most likely reflect actual changes in population levels", although they identified several biases. Unfortunately they used the Fall MWT data for all species, including *Crangon franciscorum* and starry flounder, which is an inappropriate gear and survey for those species.

Specific comments:

Page 7, section 3.1

Their characterization of San Pablo Bay is inaccurate, as San Pablo Bay is a very important nursery area for *Cancer magister*, *Crangon nigricauda*, Pacific herring, shiner perch, jacksmelt, and English sole. If San Pablo Bay characteristic species have declined in recent years, it has been because of reduced outflow and the concurrent loss of low salinity nursery habitat. Note that many "marine" species do not utilize San Pablo Bay in the summer, as temperatures are too high. Their highest abundance may be during winters with low outflow, when salinities are relatively high and temperatures low.

Page 8, last sentence

Sacramento splittail and tule perch are abundant outside of Suisun Marsh.

Page 9, last sentence

Striped bass did not rebound when the concentrations of rice herbicides in the Sacramento River decreased.

Page 10, fourth paragraph

Starry flounder and striped bass should be included in this list of species dependent on low salinity shallow waters.

Page 11, first paragraph

Striped bass would also benefit from increased nursery habitat, as YOY are abundant in low salinities. (EPA stated that "salinity criteria in Suisun Bay are necessary to protect nursery habitat of the striped bass" - this also compliments the previous comments.)

Page 12, section 4.2

Successful recruitment, not spawning, of longfin smelt has been attributed to higher outflows. We have no evidence that juveniles are distributed in shallower waters than adults, although they are in lower salinities. Adults probably migrate to shallow, low salinity or freshwater areas, to spawn.

Pages 12-13, section 4.4

Splittail are distributed in the Estuary and the lower rivers. (Note: juveniles have been collected as far upstream as Ord Bend, river mile 184, on the Sacramento River this year.)

Page 14, section 4.9

White croaker are abundant from South to San Pablo bays, with the center of distribution in Central Bay. In San Pablo Bay, YOY are most abundant in late spring/early summer. Although their distribution expanded upstream during the drought, one could not conclude that their total abundance in the Bay would decrease if the X2 standards were implemented.

Page 14, section 4.10

Starry flounder juveniles are very dependent on low salinity habitats. There has been a long term decline, but we do not know if this is due to ocean warming, bay pollution, over fishing, loss of nursery habitat or some other factor or factors.

Page 15, section 4.11

Yes, abundance of *Crangon nigricauda* and other marine species of shrimp did increase during the recent drought, but the increase was primarily in Central Bay. During this period, abundance of all species of shrimp from San Pablo Bay upstream was relatively low, especially in Suisun Bay, where five of the six lowest annual indices occurred between 1988 to 1992. Although numerical indices were relatively high during the recent drought, biomass indices were comparable to pre-drought, low outflow years.

Page 21, first paragraph

High flows in 1983 probably flushed longfin smelt larvae and juveniles from the estuary, rather than adults.

Page 22, fifth paragraph

What data is the statement regarding increased parasitism of striped bass during the drought based on? We know of no data that reports this for the 1987-1992 drought.

Page 23, section 6.4

Loss of tidal marshes downstream of the Delta is also important. Suisun Marsh and Napa marshes are two examples.

Page 25, third paragraph

The suggestion that species within habitat guilds be examined is valid, although we have little evidence that the same factors control abundance and/or biomass of Pacific herring, Pacific sardine, and northern anchovy in the Bay.

Page 26, fourth paragraph

Factors affecting white croaker abundance in the Bay include changes in commercial fishing regulations and ocean conditions. White croaker are not abundant north of Point Reyes, and recent warm-water ocean events may have been beneficial to white croaker spawning and survival. Our white croaker catches in 1993 were approximately four times greater than any previous year, with high juvenile abundance. This somewhat negates the high-salinity habitat hypothesis, although increases in abundance during the drought may have in part been due to increased habitat.

Page 26, section 7.4

We agree that confidence interval should be calculated for the annual indices; however we have yet to agree on the procedure to do so.

Page 27, section 7.6

We agree with the importance of considering all life stages; however, particular emphasis should be placed on the early period which for many species is critical to their success.

Page 29, sixth paragraph

The *Neomysis* data was collected by CDFG as a part of the IEP.

Page 35, first paragraph

The Bay Study tows the otter trawl for five minutes, not 12.

Page 36, last paragraph

Note that fish per unit volume or area is a measure of CPUE (catch-per-unit-effort).

Page 39, second paragraph

There is a very strong relationship between the Bay Study and Fall MWT longfin smelt indices ($r^2 > .95$).

Page 39, third paragraph

The "accuracy" of the mean catch for each subarea does not necessarily vary because of the different number of stations in each subarea. The major gradients in the estuary are salinity and depth, with depth possibly less important for the midwater trawl than the otter trawl. Sampling sites widely dispersed in a homogenous environment (e.g. mostly channels, no salinity gradient) would not necessarily result in data that is less "accurate" than data collected from subareas with a higher concentration of stations.

Page 40, second paragraph

The Fall MWT indices use mean catch, not total catch, from each subarea and this reduces the effect discussed here.

Page 40, third paragraph

We are not sure how the frequency distributions were corrected for sampling effort. How did they define their bins (groupings)? Some additional information would be helpful here.

Comments on CUWA Reference #5:

Evaluation of Potential effects of the proposed EPA salinity standard on the biological resources of the San Francisco Bay/Sacramento-San Joaquin Estuary

General comments:

The basic science used in this evaluation is weak, as the authors have inaccurately described life histories for several species and used incorrect or out-of-date salinity "tolerances". The descriptions of species/life stage distributions and salinity "tolerances" share a deficiency - they are usually ranges, not the center of distribution or percentiles.

The use of a linear habitat index (vs. area or volume), based only on salinity, is very misleading. This index treats all segments as equal in habitat value and consequently does not account for the increased area of San Pablo and Suisun bays. The evaluation also assumes that increased habitat (defined only by salinity) results in a distributional shift and increased abundance. Except for the estuary dependent species used in the EPA analysis, the amount of habitat is not correlated with Bay-wide abundance. A distributional shift could result in increased abundance in an area or embayment, but not necessarily an increase in total, bay-wide abundance. **For a variety of freshwater and marine species, there is no evidence that the amount of available habitat, based solely on salinity, controls abundance.** Habitat is also temperature, depth, currents, vegetation, and substrate. We should not have to point out the other factors that effect abundance include ocean currents and temperatures, bay currents (tidal and non-tidal), entrainment of loss of eggs, larvae, and juveniles, broodstock abundance, etc. We have been developing procedures to calculate nursery habitat and are willing to work with your staff to apply these procedures to a wider range of species.

Primarily freshwater species benefited from moving X2 from the confluence to Chipps or Roe islands. The authors assumed that there is increased habitat for these species as outflow moved X2 downstream and that the distribution of these species expanded with increased outflow. It is also reasonable to assume that the distribution of some of these species **shifts** downstream with increased outflow, and consequently there is no increase in habitat. Their evaluation also assumes downstream habitat to be comparable to the upstream habitat, including emergent vegetation, channel velocity (or lack of), depth and substrate which may not be the case.

The species that reportedly did not benefit from moving X2 downstream are primarily marine, although some life stages of estuarine species are included. Again, expanded distribution, as X2 moves upstream, does not necessarily result in increased abundance. For the marine species, the interaction of temperature and salinity is critical. We typically collected species tolerant of higher salinities in the upper reaches of the estuary in the winter and early spring during the drought, when temperatures were low and salinities relatively high. As a generalization, marine species do not tolerate salinities at the low end of their range combined with high temperatures.

The habitat evaluation is also weakened by the downstream limitation to mid-San Pablo Bay. Downstream areas, including the near-shore ocean area, are important habitats, especially for spawners and larvae. The larvae and juveniles of many of these species have evolved behavior that enhances their migration from the higher salinity spawning areas to the lower salinity nursery. There is no evidence that year-class strength is affected by the longitudinal distribution of spawners.

Specific comments:

Page 2

The Delta Outflow/San Francisco Bay Study is finalizing a report that summarizes the life history, annual and seasonal abundance and distribution trends, and salinity and temperature association for the more commonly collected species.

Page 4

Why aren't *Neomysis* and other zooplankton, benthos, *Crangon nigricauda*, *Palaemon*, lampreys, elasmobranchs other than leopard shark, and walleye surfperch (second most abundant embiotocid) included in this analysis?

Page 6

The Bay Study data not the Fall Midwater Trawl, is the most appropriate data base for the marine species.

Page 8

The use of a mid-depth (5 m) salinity for both pelagic and demersal species can result in distortions especially where significant stratification occurs. This should be refined, as the difference in surface and bottom location of a salinity or salinity range could be several kilometers.

The broad ranges of the salinity classes used (5, 10, 15 etc.) will obscure much of the detail that is sought here.

Page 24

The authors misinterpreted Exhibit 6, as they applied the *C. franciscorum* salinity statistics for all size to only adults. We could supply the 10th and 90th percentiles for all adults. They hedge the potential impacts of X2, as they express the impacts "in terms of its distribution in the upper estuary". How does distribution in the upper estuary relate to Bay-wide abundance?

Pages 30 and 31

In their evaluation of potential impacts of X2 on various species of embiotocids, they assumed all species are similar to shiner perch. Shiner perch are more euryhaline than the other species.

Page 35

The Pacific herring life history is incorrect, as they do not move out of the Bay soon after hatching.

The species periodicity and distribution charts (Appendix A) are full of errors. Broad categories of errors are: incorrect salinity "tolerances", inaccurate depiction of the temporal usage of the upper estuary by various life stages, and inconsistent expansion of distribution based on salinity tolerance and location of X2. Example of the later: all bay goby life stages occur at salinities $> 18\text{‰}$, but the distribution of juveniles and adults range further upstream than larvae and spawners.

Comments on CUWA Reference No. 6

Evaluation of Factors Potentially Limiting Aquatic Species Abundance and Distribution in the San Francisco Bay/Sacramento - San Joaquin Estuary

General Comments:

Many of the points discussed in this report have no data or reference supporting them. Most of the statements are coached with words like "may" and "might". In short most of this report is speculation and should be treated as such.

In several places a single reference was cited to support a series of statements. While the use of these references is correct, they represent only one side of a debate and in most cases they are a very small minority. A more balanced review of the literature would reveal that their views or theories are not widely accepted.

Specific Comments:

Page 14, last paragraph

There is no debate that drought had severe impacts on numerous species. An important point not addressed here is that the X2 Standard would afford more protection during the dry and critical years than now exists under the D1485 Standard. Just how the effects of the extended drought could be evaluated independent of exports is a difficult question.

Page 15, second paragraph

What are the several "key" species? Where is the data supporting this idea that drought or flood conditions has led to their decline?

Page 15, third paragraph

Listed as one of the longest drought periods is 1985-1992. 1986 has been classified as a wet year and had the highest February outflows on record. The drought period should be 1987-1992.

The statement that high outflows during 1986 flushed a high percentage of the mature longfin adults from the estuary needs proof, otherwise it is baseless speculation. We do not agree with this statement.

Page 16

The first sentence in this paragraph is not supported by the remainder of the paragraph. Combinations of extreme years does lead to variability as discussed, but its role in the decline is unknown at best.

Page 18

DWR is currently investigating the impacts of non-screened diversions in the delta. State law states that all diversions shall be screened. DFG is enforcing this by requiring all new or

altered diversions to be screened. Existing diversions will not be required to be screened until they are modified.

Page 20, first paragraph

Sacramento perch are not extinct. They are common in several reservoirs on the east side of the Sierra. They have also been reported in the Delta; however they have not been collected by any recent trawl surveys.

Page 21, last paragraph

The loss of marsh and wetland habitat occurred more than 50 years ago. Why is this even being discussed unless this is being proposed as a recovery measure?

Page 28, second paragraph

McGinnis's observations on inland silverside populations and feeding habitats are based on a restricted number (only one is mentioned in his book) of sample sites. Thus his conclusions about the populations size in the delta and their overall impact should be interpreted accordingly.

Page 31, second paragraph

Crangon franciscorum should not be part of this discussion of declines associated with the introduction of exotic zooplankton or invertebrates. No evidence exists to demonstrate this to our knowledge.

Page 35

The impact of fishing regulations on striped bass, sturgeon, salmon, steelhead, and American shad is routinely evaluated and revised as necessary. Recent changes in the minimum size and bag limit for striped bass (1982) and the slot limit for sturgeon are two examples.

Page 39

Neither Cashman et al.(1992) nor Young et al. (1994) have been able to link the spring die off of striped bass to toxics. The correlation between the spring die off of 2+ striped bass in the Carquinez Strait and the use of rice herbicides is speculation without any supporting data. The effect of these herbicides on zooplankton especially in the laboratory is well known, their effect in the field has been hard to demonstrate. The whole question about these herbicides is somewhat moot, given that regulations governing their use and discharge have recently been put into effect.

Page 40

Starry flounder have been reported to spawn in the bay; however, no evidence of spawning, ripe adults or untransformed larvae, has been observed since 1980.

Page 50, third paragraph

We don't think the biological premise of EPA's X2 standard is that a variety of aquatic organisms have an affinity to the 2 ppt isohaline. The logic behind the X2 standard as we understand it is that the X2 standard establishes favorable habitat conditions for a range of estuarine species and these conditions are maximized when X2 occurs in the Suisun Bay area.

The analysis used to support the position that only 1 or 2 species would benefit is flawed. See review of that CUWA reference document for our comments.

Page 53, second paragraph

To say that other factors, such as upstream effects, may prevent biological responses is rather strong and probably not supportable.

Page 54

This type of mass correlation analysis is useful only as an initial exploration tool. The choice of factors contains numerous autocorrelated variables. The large number of variables also increases the risk of obtaining spurious values due to random chance. The linkage between variables from a biological standpoint was done after the analysis. So rather than testing a hypothesis, hypotheses were generated and defended based on the results.

Page 56

In the striped bass column, 0.78 is the greatest value not 0.69. A number of high correlations are garbage or at best of no use. In fact many of the variables are the result of serial correlations.

Page 57

The methods statement says all variables were used in the cluster analysis, yet only part of them appear in the dendrogram. Where is the full set?

Young, G., C.L. Brown, R.S. Nishioka, L.C. Folmar, M. Andrews, J.R. Cashman, and H.A. Bern. 1994 Histopathology, blood chemistry, and physiological status of normal and moribund striped bass (*Morone saxatilis*) involved in summer mortality ('die-off') in the Sacramento-San Joaquin Delta of California. *Journal of Fish Biology* 44: 491-512

Comments on CUWA document #7

Evaluation of the relationship between biological indicators and the position of X2

General Comments:

The results of the analysis of Fall Midwater Trawl data for marine species (jacksmelt, northern anchovy, Pacific herring, topsmelt and white croaker) should be viewed with great caution because this survey doesn't cover these species full distribution in the estuary, in fact in some years it barely covers their distribution. The Bay Study would be a much better data source.

We consider inland silversides and threadfin shad neither euryhaline nor estuarine species. They are freshwater species.

Many of the comments we have for this report were made in our comments the sections of Attachment 2 that were based on this report.

DEPARTMENT OF FISH AND GAME

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Mr. Lyle Hoag

July 14, 1994

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If you have any questions regarding our comments or need any information or assistance from us, please contact Chuck Armor at (209) 942-6077.

Sincerely,

Perry L. Herrgesell

Perry L. Herrgesell Ph.D.

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Page 7 as it relates to Appendix 1

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We are still not comfortable with using the successive months of the Fall Midwater Trawl as replicate samples for statistical determination of within year variance. Factors such as mortality are occurring during the four month MWT sample period and this mortality is not constant for any given month or year.

Page 8 item B. 1) and its supporting material in Appendix 4

Figure 4-1 is used to suggest that catch can be influenced by outflow. The variable "flow" in DFG database was mistaken for delta outflow. "Flow" is actually the meter reading from the flow meter indicating the number of revolutions the flow meter made during the trawl. Thus this figure demonstrates nothing and should be disregarded.

Page 9 item B. 4) and its supporting material in Appendix 4

Figure 4-2 notes an apparent sampling bias relating to time of day. It is unclear whether this figure represents data from September-December 1980 as stated in the figure legend or September 1980 only as stated in the title. This apparent bias is an artifact of how samples were collected. Typically samples were taken near the harbor in the early morning and these sites were mostly in the lower Sacramento River where the highest delta smelt densities occur.

Page 9 item B. 6)

Abundance indices can be affected by distribution if the distribution extends significantly outside the study area. If abundance increases with outflow (as it does for some species), there may be a tendency to under estimate abundance by some survey in the higher flow years. This is the case for starry flounder and *Crangon franciscorum*. There is no evidence that this is the case for striped bass and delta smelt in the Fall MWT. The inclusion of starry flounder and *Crangon franciscorum* data from the Fall MWT raises a number of serious questions. The midwater trawl doesn't effectively sample these two species and in fact was not designed nor fished in a manner to collect these species. The data for these species was recorded for the Fall MWT, but it should not be used for anything other than the most qualitative purposes. This is the wrong gear for these species and the wrong survey. The appropriate data source would be from the Delta Outflow/San Francisco Bay Study otter trawl.

As to the question of differences between the Bay Study and the Fall MWT surveys, both surveys use the same net and fishing methods. The annual abundance indices of longfin smelt between these two studies are highly correlated ($r^2 > .95$).

Based on the above facts and our knowledge of how the samples were collected, we don't think these two examples demonstrate bias.

Page 9 item C. 1)

We are not sure what is being said here. The biologically critical period for many of the species use in EPA's X2 analysis occurs in the February through June period and this is also the proposed regulatory period. Which species critical periods are outside of the proposed regulatory period?

Page 10 item C. 3)

This issue was discussed during the CUWA-Bay Institute Workshop and is no longer an issue.

Page 10 item D

We would strongly disagree that longfin smelt has not declined and that splittail have increased. These conclusions are not supported by any of the data sets we have available. How were the indices corrected? The methods are not detailed here nor are they referenced to any supporting reports.

Page 10 item D 2) Appendix 5

This list of species contains a number for which no relationship between X2 and abundance would be expected (based on life history, nursery habitat, etc.) including chinook salmon, American shad, threadfin shad, jacksmelt, northern anchovy, topsmelt and white croaker.

Page 10 item E

See attached comments from DFG statistician, John Geibel for a discussion of non-continuous data.

Page 10 item F

Recent analysis by DFG and DWR of salvage and splittail abundance suggests this may not be the case.

Page 10

We disagree with the statement that the habitat of a majority of estuarine species is greatest under the flow conditions of 8,000 - 15,000 cfs. This is especially true if the list is confined to estuarine dependent species (eg. *Crangon franciscorum*, longfin smelt and starry flounder) and those misclassified as estuarine species are excluded (eg. threadfin shad). Regressions of abundance on outflow or X2 clearly demonstrate that abundance continues to increase at higher flows.

Page 12 item A

Another obvious conclusion from the figures in Appendix 1 is that abundances increase exponentially with outflow.

Page 12 item B

How was the "significant" increase in variability determined for X2 values of 70-75?

Page 13 item D

Those species listed in Appendix 5 are not all estuarine species, many are marine species and their inclusion in this analysis adds nothing. White sturgeon, a demersal species, would not be sampled adequately with a midwater trawl. Threadfin shad are typically a lake species and in the estuary tend to be most abundant in "quiet water" such as dead end sloughs.

Page 13 last paragraph

The list of mechanisms should also include "reduced losses to water diversion from the delta".

Page 14 item 4) and specifically Table 6-1 in Appendix 6

This table was revised following suggestions made during the DFG and CUWA meeting. The revised table (listed as Table 1 in a handout at the CUWA and Bay Institute meeting) should be made available to all who received the original material.

Page 16 item C 2)

As a matter of clarification, striped bass eggs are slightly more dense than water and are not "on the bottom". In any case the eggs aren't the issue as the egg stage lasts only about two days. Striped bass larvae can be carried out of Suisun Bay when flows are high.

Page 16 item D 1)

While we don't necessarily disagree with this statement, it would be very helpful if some of this evidence were presented for evaluation.

Page 16 item D 2)

The turbidity analysis should be limited to the winter-spring (and possibly early summer) period because during the summer and fall turbidity may be due more to significant resuspension of sediments by wind and wave action than outflow. Doing this would also keep this analysis consistent with other analyses where the time period was limited to the spring-early summer period.

A review of the plots provided shows that maximum turbidity occurs at flows from 12,000 to 28,000 cfs in area 12, 12,000 to 16,000 cfs in area 13 and 12,000 to 85,000 in area 14. High turbidity values (secchi disk values of 0.2 m were common across the full range of outflows.

Page 16 item D 3)

Where is the evidence that midwater trawl catches are greater when turbidity is high? Catches of what? Is there a general relationship? Is there a critical level? What evidence exists to demonstrate net avoidance and prey capture are tied together?

Page 17 item E 3) and Appendix 8

We have serious reservations about the methods used and the conclusions reached in this analysis. For details, see our comments on CUWA reference #5 in Appendix 3 of this letter.

Page 17 item F 1)

See comment on this analysis in the notes from the CUWA - Bay Institute Workshop. They accurately reflect thoughts on this analysis.

Page 17 item F 2) and Appendix 8

Comments for page 17 item E 3) and Appendix 8 apply here.

Page 18 item D and Appendix 8

Comments for page 17 item E 3) and Appendix 8 apply here.

Page 20 item C and Appendix 9

Comments for page 17 item F 1) apply here.

Page 20 item D

Data for marine species from the Fall MWT should not be used given their distribution and the area sampled by the Fall MWT.

This analysis would be more meaningful if the effect of X2 on a given species were weighted by each species dependence on the estuary. Since inland silversides and threadfin shad are freshwater species any adverse impacts on them would be downgraded while the effect on estuarine dependent species such as longfin smelt would be accurately portrayed.

Page 20 item E

Comments for page 17 item E 3) apply here.

Page 23 item G

The pulse of pesticides studies by USGS occurs during the first high flow event in the late winter or early spring not summer. This timing follows the early spring spraying that takes place in many of the orchards in the drainage basin.

Comments on CUWA Reference #4:

Review and evaluation of foundational literature and data related to the proposed EPA salinity standard

Summary:

We disagree with the conclusion that only a limited number of euryhaline species benefit from EPA's X2 standard and that the ecosystem or community was not considered. An entire ecosystem, consisting of species dependent on brackish areas, benefit from the proposed X2 standard. All the native euryhaline species, and striped bass, were included in EPA's justification. *Palaemon* and yellowfin goby, which are introduced, and sturgeon, which are anadromous, are the only common euryhaline species not included by EPA.

From their review of the data, the authors concluded that the changes in annual abundance indices "most likely reflect actual changes in population levels", although they identified several biases. Unfortunately they used the Fall MWT data for all species, including *Crangon franciscorum* and starry flounder, which is an inappropriate gear and survey for those species.

Specific comments:

Page 7, section 3.1

Their characterization of San Pablo Bay is inaccurate, as San Pablo Bay is a very important nursery area for *Cancer magister*, *Crangon nigricauda*, Pacific herring, shiner perch, jacksmelt, and English sole. If San Pablo Bay characteristic species have declined in recent years, it has been because of reduced outflow and the concurrent loss of low salinity nursery habitat. Note that many "marine" species do not utilize San Pablo Bay in the summer, as temperatures are too high. Their highest abundance may be during winters with low outflow, when salinities are relatively high and temperatures low.

Page 8, last sentence

Sacramento splittail and tule perch are abundant outside of Suisun Marsh.

Page 9, last sentence

Striped bass did not rebound when the concentrations of rice herbicides in the Sacramento River decreased.

Page 10, fourth paragraph

Starry flounder and striped bass should be included in this list of species dependent on low salinity shallow waters.

Page 11, first paragraph

Striped bass would also benefit from increased nursery habitat, as YOY are abundant in low salinities. (EPA stated that "salinity criteria in Suisun Bay are necessary to protect nursery habitat of the striped bass" - this also compliments the previous comments.) ...

Page 12, section 4.2

Successful recruitment, not spawning, of longfin smelt has been attributed to higher outflows. We have no evidence that juveniles are distributed in shallower waters than adults, although they are in lower salinities. Adults probably migrate to shallow, low salinity or freshwater areas, to spawn.

Pages 12-13, section 4.4

Splittail are distributed in the Estuary and the lower rivers. (Note: juveniles have been collected as far upstream as Ord Bend, river mile 184, on the Sacramento River this year.)

Page 14, section 4.9

White croaker are abundant from South to San Pablo bays, with the center of distribution in Central Bay. In San Pablo Bay, YOY are most abundant in late spring/early summer. Although their distribution expanded upstream during the drought, one could not conclude that their total abundance in the Bay would decrease if the X2 standards were implemented.

Page 14, section 4.10

Starry flounder juveniles are very dependent on low salinity habitats. There has been a long term decline, but we do not know if this is due to ocean warming, bay pollution, over fishing, loss of nursery habitat or some other factor or factors.

Page 15, section 4.11

Yes, abundance of *Crangon nigricauda* and other marine species of shrimp did increase during the recent drought, but the increase was primarily in Central Bay. During this period, abundance of all species of shrimp from San Pablo Bay upstream was relatively low, especially in Suisun Bay, where five of the six lowest annual indices occurred between 1988 to 1992. Although numerical indices were relatively high during the recent drought, biomass indices were comparable to pre-drought, low outflow years.

Page 21, first paragraph

High flows in 1983 probably flushed longfin smelt larvae and juveniles from the estuary, rather than adults.

Page 22, fifth paragraph

What data is the statement regarding increased parasitism of striped bass during the drought based on? We know of no data that reports this for the 1987-1992 drought.

Page 23, section 6.4

Loss of tidal marshes downstream of the Delta is also important. Suisun Marsh and Napa marshes are two examples.

Page 25, third paragraph

The suggestion that species within habitat guilds be examined is valid, although we have little evidence that the same factors control abundance and/or biomass of Pacific herring, Pacific sardine, and northern anchovy in the Bay.

Page 26, fourth paragraph

Factors affecting white croaker abundance in the Bay include changes in commercial fishing regulations and ocean conditions. White croaker are not abundant north of Point Reyes, and recent warm-water ocean events may have been beneficial to white croaker spawning and survival. Our white croaker catches in 1993 were approximately four times greater than any previous year, with high juvenile abundance. This somewhat negates the high-salinity habitat hypothesis, although increases in abundance during the drought may have in part been due to increased habitat.

Page 26, section 7.4

We agree that confidence interval should be calculated for the annual indices; however we have yet to agree on the procedure to do so.

Page 27, section 7.6

We agree with the importance of considering all life stages; however, particular emphasis should be placed on the early period which for many species is critical to their success.

Page 29, sixth paragraph

The *Neomysis* data was collected by CDFG as a part of the IEP.

Page 35, first paragraph

The Bay Study tows the otter trawl for five minutes, not 12.

Page 36, last paragraph

Note that fish per unit volume or area is a measure of CPUE (catch-per-unit-effort).

Page 39, second paragraph

There is a very strong relationship between the Bay Study and Fall MWT longfin smelt indices ($r^2 > .95$).

Page 39, third paragraph

The "accuracy" of the mean catch for each subarea does not necessarily vary because of the different number of stations in each subarea. The major gradients in the estuary are salinity and depth, with depth possibly less important for the midwater trawl than the otter trawl. Sampling sites widely dispersed in a homogenous environment (e.g. mostly channels, no salinity gradient) would not necessarily result in data that is less "accurate" than data collected from subareas with a higher concentration of stations.

Page 40, second paragraph

The Fall MWT indices use mean catch, not total catch, from each subarea and this reduces the effect discussed here.

Page 40, third paragraph

We are not sure how the frequency distributions were corrected for sampling effort. How did they define their bins (groupings)? Some additional information would be helpful here.

Comments on CUWA Reference #5:

Evaluation of Potential effects of the proposed EPA salinity standard on the biological resources of the San Francisco Bay/Sacramento-San Joaquin Estuary

General comments:

The basic science used in this evaluation is weak, as the authors have inaccurately described life histories for several species and used incorrect or out-of-date salinity "tolerances". The descriptions of species/life stage distributions and salinity "tolerances" share a deficiency - they are usually ranges, not the center of distribution or percentiles.

The use of a linear habitat index (vs. area or volume), based only on salinity, is very misleading. This index treats all segments as equal in habitat value and consequently does not account for the increased area of San Pablo and Suisun bays. The evaluation also assumes that increased habitat (defined only by salinity) results in a distributional shift and increased abundance. Except for the estuary dependent species used in the EPA analysis, the amount of habitat is not correlated with Bay-wide abundance. A distributional shift could result in increased abundance in an area or embayment, but not necessarily an increase in total, bay-wide abundance. **For a variety of freshwater and marine species, there is no evidence that the amount of available habitat, based solely on salinity, controls abundance.** Habitat is also temperature, depth, currents, vegetation, and substrate. We should not have to point out the other factors that effect abundance include ocean currents and temperatures, bay currents (tidal and non-tidal), entrainment of loss of eggs, larvae, and juveniles, broodstock abundance, etc. We have been developing procedures to calculate nursery habitat and are willing to work with your staff to apply these procedures to a wider range of species.

Primarily freshwater species benefited from moving X2 from the confluence to Chipps or Roe islands. The authors assumed that there is increased habitat for these species as outflow moved X2 downstream and that the distribution of these species expanded with increased outflow. It is also reasonable to assume that the distribution of some of these species **shifts** downstream with increased outflow, and consequently there is no increase in habitat. Their evaluation also assumes downstream habitat to be comparable to the upstream habitat, including emergent vegetation, channel velocity (or lack of), depth and substrate which may not be the case.

The species that reportedly did not benefit from moving X2 downstream are primarily marine, although some life stages of estuarine species are included. Again, expanded distribution, as X2 moves upstream, does not necessarily result in increased abundance. For the marine species, the interaction of temperature and salinity is critical. We typically collected species tolerant of higher salinities in the upper reaches of the estuary in the winter and early spring during the drought, when temperatures were low and salinities relatively high. As a generalization, marine species do not tolerate salinities at the low end of their range combined with high temperatures.

The habitat evaluation is also weakened by the downstream limitation to mid-San Pablo Bay. Downstream areas, including the near-shore ocean area, are important habitats, especially for spawners and larvae. The larvae and juveniles of many of these species have evolved behavior that enhances their migration from the higher salinity spawning areas to the lower salinity nursery. There is no evidence that year-class strength is affected by the longitudinal distribution of spawners.

Specific comments:

Page 2

The Delta Outflow/San Francisco Bay Study is finalizing a report that summarizes the life history, annual and seasonal abundance and distribution trends, and salinity and temperature association for the more commonly collected species.

Page 4

Why aren't *Neomysis* and other zooplankton, benthos, *Crangon nigricauda*, *Palaemon*, lampreys, elasmobranchs other than leopard shark, and walleye surfperch (second most abundant embiotocid) included in this analysis?

Page 6

The Bay Study data not the Fall Midwater Trawl, is the most appropriate data base for the marine species.

Page 8

The use of a mid-depth (5 m) salinity for both pelagic and demersal species can result in distortions especially where significant stratification occurs. This should be refined, as the difference in surface and bottom location of a salinity or salinity range could be several kilometers.

The broad ranges of the salinity classes used (5, 10, 15 etc.) will obscure much of the detail that is sought here.

Page 24

The authors misinterpreted Exhibit 6, as they applied the *C. franciscorum* salinity statistics for all size to only adults. We could supply the 10th and 90th percentiles for all adults. They hedge the potential impacts of X2, as they express the impacts "in terms of its distribution in the upper estuary". How does distribution in the upper estuary relate to Bay-wide abundance?

Pages 30 and 31

In their evaluation of potential impacts of X2 on various species of embiotocids, they assumed all species are similar to shiner perch. Shiner perch are more euryhaline than the other species.

Page 35

The Pacific herring life history is incorrect, as they do not move out of the Bay soon after hatching.

The species periodicity and distribution charts (Appendix A) are full of errors. Broad categories of errors are: incorrect salinity "tolerances", inaccurate depiction of the temporal usage of the upper estuary by various life stages, and inconsistent expansion of distribution based on salinity tolerance and location of X2. Example of the later: all bay goby life stages occur at salinities $> 18\text{‰}$, but the distribution of juveniles and adults range further upstream than larvae and spawners.

Comments on CUWA Reference No. 6

Evaluation of Factors Potentially Limiting Aquatic Species Abundance and Distribution in the San Francisco Bay/Sacramento - San Joaquin Estuary

General Comments:

Many of the points discussed in this report have no data or reference supporting them. Most of the statements are coached with words like "may" and "might". In short most of this report is speculation and should be treated as such.

In several places a single reference was cited to support a series of statements. While the use of these references is correct, they represent only one side of a debate and in most cases they are a very small minority. A more balanced review of the literature would reveal that their views or theories are not widely accepted.

Specific Comments:

Page 14, last paragraph

There is no debate that drought had severe impacts on numerous species. An important point not addressed here is that the X2 Standard would afford more protection during the dry and critical years than now exists under the D1485 Standard. Just how the effects of the extended drought could be evaluated independent of exports is a difficult question.

Page 15, second paragraph

What are the several "key" species? Where is the data supporting this idea that drought or flood conditions has led to their decline?

Page 15, third paragraph

Listed as one of the longest drought periods is 1985-1992. 1986 has been classified as a wet year and had the highest February outflows on record. The drought period should be 1987-1992.

The statement that high outflows during 1986 flushed a high percentage of the mature longfin adults from the estuary needs proof, otherwise it is baseless speculation. We do not agree with this statement.

Page 16

The first sentence in this paragraph is not supported by the remainder of the paragraph. Combinations of extreme years does lead to variability as discussed, but its role in the decline is unknown at best.

Page 18

DWR is currently investigating the impacts of non-screened diversions in the delta. State law states that all diversions shall be screened. DFG is enforcing this by requiring all new or

altered diversions to be screened. Existing diversions will not be required to be screened until they are modified.

Page 20, first paragraph

Sacramento perch are not extinct. They are common in several reservoirs on the east side of the Sierra. They have also been reported in the Delta; however they have not been collected by any recent trawl surveys.

Page 21, last paragraph

The loss of marsh and wetland habitat occurred more than 50 years ago. Why is this even being discussed unless this is being proposed as a recovery measure?

Page 28, second paragraph

McGinnis's observations on inland silverside populations and feeding habitats are based on a restricted number (only one is mentioned in his book) of sample sites. Thus his conclusions about the populations size in the delta and their overall impact should be interpreted accordingly.

Page 31, second paragraph

Crangon franciscorum should not be part of this discussion of declines associated with the introduction of exotic zooplankton or invertebrates. No evidence exists to demonstrate this to our knowledge.

Page 35

The impact of fishing regulations on striped bass, sturgeon, salmon, steelhead, and American shad is routinely evaluated and revised as necessary. Recent changes in the minimum size and bag limit for striped bass (1982) and the slot limit for sturgeon are two examples.

Page 39

Neither Cashman et al.(1992) nor Young et al. (1994) have been able to link the spring die off of striped bass to toxics. The correlation between the spring die off of 2+ striped bass in the Carquinez Strait and the use of rice herbicides is speculation without any supporting data. The effect of these herbicides on zooplankton especially in the laboratory is well known, their effect in the field has been hard to demonstrate. The whole question about these herbicides is somewhat moot, given that regulations governing their use and discharge have recently been put into effect.

Page 40

Starry flounder have been reported to spawn in the bay; however, no evidence of spawning, ripe adults or untransformed larvae, has been observed since 1980.

Page 50, third paragraph

We don't think the biological premise of EPA's X2 standard is that a variety of aquatic organisms have an affinity to the 2 ppt isohaline. The logic behind the X2 standard as we understand it is that the X2 standard establishes favorable habitat conditions for a range of estuarine species and these conditions are maximized when X2 occurs in the Suisun Bay area.

The analysis used to support the position that only 1 or 2 species would benefit is flawed. See review of that CUWA reference document for our comments.

Page 53, second paragraph

To say that other factors, such as upstream effects, may prevent biological responses is rather strong and probably not supportable.

Page 54

This type of mass correlation analysis is useful only as an initial exploration tool. The choice of factors contains numerous autocorrelated variables. The large number of variables also increases the risk of obtaining spurious values due to random chance. The linkage between variables from a biological standpoint was done after the analysis. So rather than testing a hypothesis, hypotheses were generated and defended based on the results.

Page 56

In the striped bass column, 0.78 is the greatest value not 0.69. A number of high correlations are garbage or at best of no use. In fact many of the variables are the result of serial correlations.

Page 57

The methods statement says all variables were used in the cluster analysis, yet only part of them appear in the dendrogram. Where is the full set?

Young, G., C.L. Brown, R.S. Nishioka, L.C. Folmar, M. Andrews, J.R. Cashman, and H.A. Bern. 1994 Histopathology, blood chemistry, and physiological status of normal and moribund striped bass (*Morone saxatilis*) involved in summer mortality ('die-off') in the Sacramento-San Joaquin Delta of California. Journal of Fish Biology 44: 491-512

Admin
Rec

JUL 13 1994

Mr. James Lenihan
Chairman, Board of Directors
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118-3686

Dear Mr. Lenihan:

Thank you for your recent letter to the President regarding your support for joint Federal-State efforts to address the problems facing the San Francisco Bay/Delta. I share your interest in the development of a joint effort to address the environmental needs of the estuary and the water supply needs of the state. I am very pleased to report the recent completion of a Framework Agreement between the state of California and the Federal government which is designed to satisfy the need for joint coordination.

The Agreement allows for the development of joint State and Federal programs that will address water quality and quantity problems in the Bay/Delta. It is a first step toward resolution of Bay/Delta management issues and coordination of the regulatory process. The Framework Agreement creates a structure for officials from State and Federal agencies to meet regularly and make coordinated regulatory decisions regarding the Bay/Delta.

In your letter, you also express concerns about the recently proposed Environmental Protection Agency water quality standards and their potential impact on Santa Clara County. Since we published our draft standards this January, we have received over 200 comments on all aspects of the proposal. Many of these comments have suggested changes in one or more of the criteria being proposed that would maintain their environmental benefits while reducing the water supply impacts of the proposal. We are actively analyzing the feasibility and effect of a range of alternative proposals submitted as part of this review. EPA is committed to achieving the necessary protection of the Bay/Delta's resources in the most efficient way possible.

Again, on behalf of the President, I welcome your support for a joint State-Federal solution process for Bay/Delta issues and thank you for your comments regarding our proposed water quality standards. I believe that our final proposal for water quality standards will go a long way toward addressing the water supply concerns you have expressed. If you have any additional questions regarding the standards, please call Patrick Wright, Chief, Bay/Delta Section, at (415) 744-1993.

Sincerely,

original signed by
John Wise
John Wise
Deputy Regional Administrator

Symbol	W-2-4	h							
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Date	7-15-94	15/July	7.15.94						

Santa Clara Valley Water District



5750 ALMADEN EXPRESSWAY
SAN JOSE, CA 95118-3686
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AN AFFIRMATIVE ACTION EMPLOYER

July 15, 1994

Palma Risler
U.S. EPA, Region 9
W-3-3
75 Hawthorne Street
San Francisco, CA 94105

Dear Palma:

Subject: Comments on the "Draft Regulatory Impact Assessment of the Proposed Water Quality Standards for the San Francisco Bay/Delta and Critical Habit Requirements for the Delta Smelt"

The analytic framework dated July 11, 1994, is a real step in the right direction. While there remains much work to be done, the pieces are beginning to come together. Naturally, several issues remain unresolved, and I would like clarification of items outlined in the framework. We have discussed some of the following over the phone, so this letter contains a mix of new questions and confirmations of my understanding on others.

1. The Introduction states that the "actual modeling work" would be done in late July and early August. I understand that this refers to the economic modeling, but as we discussed, additional water supply simulations will probably be needed from DWR for 7.1 MAF.
2. I suggest you establish 1995 and 2010 as two years to analyze and not be "tentative" any longer.
3. You state that the water supply impacts should "emphasize the incremental impacts that are attributable to CWA" but need to decide how to determine the increment over winter-run salmon impacts. We discussed the modeling problems and alternatives at length on June 28. How is this going to be resolved? Continuing with the approach of the Draft RIA should at least be a starting point.
4. I do not understand the significance of the first sentence at the top of page 2. What are the "pre-existing delivery impacts?"
5. Under delivery impacts on page 2, we need to make a specific assumption on the M&I preference policy of the CVP. As I understand it, there is no formal policy; therefore, I suggest that not be included in calculations distributing CVP water.
6. I agree with the need to group delivery impacts for the RIA analysis, but want to emphasize that we need the detailed annual data to run the Santa Clara County simulations integrating imported supplies with local supplies.

P. Risler

Page 2

7. For the 2010 analysis described at the top of page 3, I understand from our telephone conversation that under "2)" you mean we have to account for supplies acquired to accommodate future growth. I agree that they need to be included as part of the base case.
8. For the urban "local supplies/reclamation" scenario discussed on page 4, we need an explicit assumption about the availability of transfers. You may want to assume some institutional arrangements such as the existing drought water bank is implemented in critical years to ease urban shortages.
9. The approach to estimating the aggregate Bay Area economic impact is not discussed. Are there any plans to include impacts to North Bay agencies?

I hope this helps you to better define the framework and avoid last minute changes. Please call if you want to discuss the above or additional issues that arise.

Sincerely,

for Julie Bottomley

John W. Ryan
Water Resources Economist
Program Analysis Division

cc: Wendy L. Illingworth, Principal
Foster Associates, Inc.
120 Montgomery Street, Ste. 1776
San Francisco, CA 94104

Santa Clara Valley Water District



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U.S. EPA, Region 9
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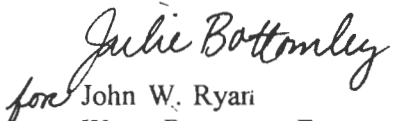
P. Risler

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for John W. Ryari
Water Resources Economist
Program Analysis Division

cc: Wendy L. Illingworth, Principal
Foster Associates, Inc.
120 Montgomery Street, Ste. 1776
San Francisco, CA 94104



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
California State Office
2800 Cottage Way, Room E-1803
Sacramento, California 95825

1. Harry
2. Clancy/
Patrick
Admission Fee
(Superceded?)

July 15, 1994

Harry Seraydarian
Environmental Protection Agency
75 Hawthorne Street
San Francisco, California

Dear Mr. Seraydarian:

This letter is to provide information on anadromous fish needs for use in the development of your water quality standards for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Please recognize that there are some possible conflicts between these recommendations for anadromous species and the needs of some listed, proposed and candidate species. Therefore, this information only relates to anadromous fish; further study and refinement will be necessary to remove and resolve any potential conflicts. We will continue to work with you to address any conflicts.

We believe several fish and wildlife standards should be evaluated as alternatives. These include: 1) Modified alternative's D and E (Attachment A), 2) D1630, 3) EPA proposed rule, 4) USFWS-WRINT-7 (original Alternatives D and E) and 5) the Delta plan being generated by the Central Valley Project Improvement Act Anadromous Fish Restoration Program, due in October of 1995, the goal of which is to aid in the doubling of striped Bass, salmon, steelhead, sturgeon and American shad populations.

We have included a modified Alternatives D and E implementation measure that would be protective of all races of juvenile salmonids migrating through the Delta. As you may be aware, spring run yearlings and late fall run juveniles would benefit from protective measures between November and January. The winter run biological opinion provides for cross channel gate closures, QWEST criteria and take limits (which could ultimately reduce exports) between February 1 and April 30. We have included proposed standards for winter run in our modified alternatives. Present proposed standards for Sacramento and San Joaquin fall run would be implemented between April through June. Since many spring run juveniles migrate through the Delta between March and May, winter and proposed fall run protection would incidentally protect this portion of the spring run population.

However, analyses of our unmarked catch at various sites in the Delta have shown that many fish over 70 millimeters are in the Delta between November and January (Figure 1) for which no protective measures are either proposed or in place. Experts from Fish and Game

familiar with spring run outmigration believe these outmigrants include the non-hybridized component of the spring run originating from Mill and Deer Creeks. (These larger smolts, no matter what specific race, are extremely important to production as a whole, as mortality at these larger sizes, after they leave the Delta, is less than for smaller fish). We believe implementation measures similar to those proposed by us for fall-run, should be incorporated during the months of November and January to protect the late-fall and spring run yearlings migrating through the Delta at that time. Although coded wire tag (CWT) data are sparse for spring- or late-fall fish, some information does exist that would qualitatively support similar protective operational measures.

For instance, we have determined that fall-run smolts diverted into the central Delta via the cross channel and Georgiana Slough survive significantly less than smolts migrating to the western Delta via the mainstem Sacramento River. Thus, closing the Delta cross channel and putting a barrier at Georgiana Slough and/or Three Mile Slough would be a operational measure that would benefit salmon smolt survival. However, this type of barrier would have other environmental impacts which would require analysis and review.

In December of 1993, paired releases of CWT groups of late-fall post-smolts were released into Georgiana Slough and Ryde. Temperature at release was 51 degrees and size at release for the two groups was 119 and 129 respectively. The smolt survival index was .21 for the Georgiana release and 1.62 for the Ryde release. This translates to a ratio of mainstem survival to that in the central Delta of 7.71. This information, based on late-fall recoveries and consistent with fall-run data, would support closure of the cross channel gates and a barrier at Georgiana Slough to prevent diversion of smolts off the mainstem Sacramento River. For fall-run we have observed a mean difference of between 3 and 8 times.

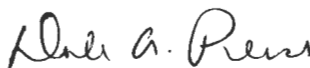
Since late-fall run and spring-run yearlings are larger in size than fall-run smolts and data were scarce, we have been unsure as to their vulnerability to diversion. However, recent data indicate that the larger fish are vulnerable to diversion. Six recoveries were made at the State Fish Facility of the late-fall smolts released at Ryde. Thirty-one were recovered at the State Fish Facility from the Georgiana Slough group with an additional 17 recovered at the Federal Fish Facility. These data imply that these larger spring- and fall-run juveniles are susceptible to diversions off the mainstem and/or reverse flows. Whether this impact is from the diversion at Three Mile Slough and/or reverse flows at Antioch is unclear, but again it appears that closure of the cross channel gates, a barrier at Georgiana Slough, reduction or elimination of reverse flows and potentially a barrier at Three Mile Slough would improve survival for these races.

In addition, these data appear to show that pumping impacts are felt by both the fish diverted into the central Delta and to a lesser degree by those migrating down the mainstem. Reduction of exports between November and January to levels less than these races have withstood historically, would benefit components of both populations.

For the experiment in December of 1993, temperature at release was 51 degrees which presumably was low enough not to reduce survival in any way. The impacts in the interior Delta due to diversion or reverse flow appears independent of temperature and most

likely are due to the indirect and direct effects of export pumping in the South Delta. Exports in 1993 were very high (10316 and 10646 cfs for the Ryde and Georgiana Slough groups, respectively, between release date and peak recovery at Chipps Island). Management of these variables, as shown in our modified Alternatives D and E, would seem appropriate based on our understanding of juvenile survival in the Delta.

Sincerely,



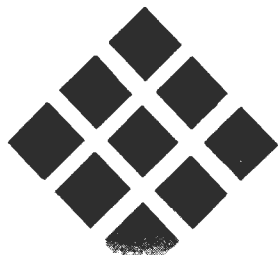
Wayne S. White
State Supervisor

cc: National Marine Fisheries Service,
Santa Rosa, CA
U.S. Bureau of Reclamation, Sacramento
U.S. Fish and Wildlife Service, Stockton

E Fall	W AN BN D C	2/1 to 6/30 all year types	2/1 to 6/30 all year types	4/1 to 6/30 zero export all year types	2/1 to 6/30 and 9/1 to 11/30 all year types	Vernalis 10000 cfs 4/1- 6/30 8000 cfs " 6000 cfs " 4000 cfs " 2000 cfs "	3000 cfs 4/1- 6/30 2500 cfs " 2000 cfs " 1500 cfs " 1000 cfs "	2/1 to 6/30 6000 cfs all year types	
Modifie d E All Races	W AN BN D C	1/1 to 6/30 , 11/1 to 12/31 all year types		1/1 to 3/31 - 1500 cfs 4/1 to 6/30 - zero 11/1 to 12/31 - 1500 cfs all year types	9/1 to 11/30 all year types	Stockton 10000 cfs 4/1- 6/30 8000 cfs " 6000 cfs " 4000 cfs " 2000 cfs "	3000 cfs 4/1- 6/30 2500 cfs " 2000 cfs " 1500 cfs " 1000 cfs "	1/1 to 6/30 11/1 to 12/31 6000 cfs all year types	

- 1/ During time periods when no cross channel closure, export level or Rio Vista is specified then those standards required under D-1485 are to be implemented. SWRCB 1991 WQCP for Delta also is to be implemented.
- 2/ Flows and exports are mean daily averages.
- 3/ Average survival (x) indices are based on the average survival for the 69 years of hydrology (1922-1991)
- 4/ Estimates of survival for all the alternatives were derived from superimposing the new flow, export, and diversion conditions on the 1995 LOD operation study (1989 demands) and then using the survival models to estimate survival. (Sacramento smolt model, 1992, San Joaquin Smolt Survival Model in draft, 1994).

ACWA



July 15, 1994

Patrick Wright, Chief, Bay-Delta Section
U. S. Environmental Protection Agency
75 Hawthorne
San Francisco, California 94105

Dear Mr. Wright:

ASSOCIATION OF
CALIFORNIA
WATER AGENCIES

*a non-profit corporation
since 1910*

This week at the California State Water Resources Control Board's fourth workshop to review standards for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, the Association of California Water Agencies (ACWA) presented a comprehensive framework to address improvements in the Bay-Delta.

The document, entitled "Framework of a Comprehensive Protection Program for the San Francisco Bay-Delta Ecosystem," has been developed by a large working group of urban and agricultural water agencies. These agencies asked ACWA to submit the plan to the State Board. The document is enclosed for your information.

I would like to highlight three key points regarding this document.

1. The document merely summarizes the comprehensive plan. Details are still being developed by those who have developed the plan.
2. The document represents an emerging consensus among the key water user groups. It represents the views of many, but by no means all, of the state's water interests. Those who have developed the plan are seeking input from other interested parties to broaden both the framework and the consensus it represents.
3. This document, though it does not contain all of the details of the plan, and does not represent complete consensus, represents an unprecedented commitment on behalf of the water user community to develop lasting solutions to the environmental and water supply problems in the Bay-Delta Estuary.

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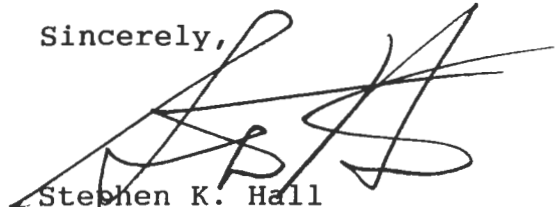
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Patrick Wright
July 15, 1994
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In submitting the document to the State Board, we asked that an additional workshop be scheduled to allow water user groups time to build on the recommendations they have developed to date.

We believe this comprehensive plan offers the most viable approach to solving problems in the Bay-Delta Estuary. It is our hope that this document will lay the groundwork necessary to achieve progress on this issue.

Sincerely,



Stephen K. Hall
Executive Director

enclosure

SKH/jpb

**FRAMEWORK OF A
COMPREHENSIVE PROTECTION PROGRAM
for the
SAN FRANCISCO BAY-DELTA ECOSYSTEM
presented to
THE STATE WATER RESOURCES CONTROL BOARD
July 12, 1994**

At the request of the State Water Resources Control Board, agricultural and urban water users have been working together to develop a comprehensive program to present to the Board. We have been making substantial progress toward drafting such a program. A number of water agencies have joined in preparing this draft description of the framework. Some of these agencies may recommend more specific elements of this program at your July workshop and in the following weeks. We continue to work jointly on a more detailed program, and when we reach consensus on it, we will forward it to the Board immediately.

We are also pursuing consensus with environmental interests. We look forward to working with your staff as the comprehensive program is developed and hope to present this program later this year with broad support. We urge the Board to adopt the Comprehensive Protection Program early in 1995, with water quality and/or Delta outflow standards as its initial keystone, even though some elements of the program will take longer to develop in detail.

BACKGROUND

The Bay-Delta system is highly altered, beginning with the conversion of the Delta from marshland to islands in the last century. The changes have continued and have been significant, including the years of hydraulic mining and resultant siltation, the continual introduction of exotic species, the variations in fishing pressure, the increase and then substantial progress toward clean-up of point source pollution, the increase and changes in pesticide use, and, of course, the development of the Central Valley water resources system, including the build-up in exports from the southern Delta.

The period since the 1976-77 drought has been of particular concern. During that period, declines have occurred in the populations of several species of fish. Two of these, the winter-run salmon and the Delta smelt have been listed under the federal and state endangered species acts and proposals have been received for listing of additional species.

Water development and increased CVP/SWP exports from the southern Delta have clearly contributed to the decline in fishery resources. These impacts must be addressed through a comprehensive program that includes water quality standards, outflow requirements, and controls on water project operations.

In addition, to better ensure success, we believe there must be controls on other factors. The decline in fishery resources has occurred in an already highly altered ecosystem. It is likely that the more recent changes in water project operations have had greater adverse effects than they otherwise would have had without these prior alterations. For example, if the Delta were still a marsh, the upstream location of the 2 ppt salinity level in the spring might not have significant adverse effects on species requiring shallow water habitat near that salinity.

The environmental constraints placed on water projects are of concern to water agencies for two reasons:

First, they do not address the other factors, beside water project operations, contributing to the decline of fishery resources. Therefore, water quality standards, outflow requirements, or constraints on water project operations, by themselves, are an incomplete solution to the problem and, by themselves, would not result in recovery of aquatic resources. Early promulgation of water quality standards, outflow requirements, and operational constraints should be accompanied by repaid progress on other factors.

Second, by curtailing project operations, the fishery protection requirements limit water deliveries, resulting in water shortages, even in wet years. Also, there is uncertainty inherent in the requirements. Water users do not know what the requirements will be from year to year. Once the requirements are set for the year, there is still uncertainty about their effect (e.g., take limits). Also fishery protections severely constrain current opportunities for water transfers and future opportunities for water banking, two environmentally acceptable ways to make up for some of the shortages. Finally, failure to address other factors could, in the extreme, result in future additional constraints on water project operations without providing the needed level of protection to the fishery resources.

GENERAL DESCRIPTION OF A COMPREHENSIVE PROGRAM FOR THE DELTA SUISUN BAY SYSTEM.

We support a comprehensive program with control measures falling into three categories.

Category I: Additional standards controlling Suisun Bay or estuarine salinity or Delta overflow.

These consist of some form of supplemental Delta outflow requirements or estuarine habitat standard in addition to the roughly 5 MAF/yr of outflow already required in D-1485, incorporating a sliding scale and various other features about which there is much consensus.

Category II: Conventional controls on water project operations.

- Direct and indirect export curtailments
- Cross Channel Gate closures
- Delta inflow requirements, including requirements for pulse flows
- Temperature control requirements for upstream reservoir releases.

Category II would include some version of those requirements already found in D-1485, the Corps of Engineers permit conditions, the DWR/DFG agreement, and the two reasonable and prudent alternatives and incidental take limits for winter-run salmon and Delta smelt but would be fashioned in a manner to provide broad protection to aquatic resources rather than directed only at individual species.

Category III: Controls on other important factors. For each of these other factors, we would provide:

- Documentation that the factor is important
- A program to be implemented by the Board or by other agencies leading to effective control of the factor.

These other important factors include the following:

- Toxics, including pesticides
- Unscreened Delta and upstream diversions
- Legal fishing
- Illegal fishing (poaching)
- Point and non-point sources of pollutants
- Land-derived salt discharges to the southern Delta
- Channel alterations, such as dredging
- Species management, such as striped bass enhancement programs
- Exotic (introduced) species
- Re-establishment of shallow water and riparian habitat in and upstream of the Delta
- Improvements in instream conditions for the spawning of fish.

Category III includes certain actions identified in the San Francisco Estuary Project Comprehensive Conservation and Management Plan to address the decline in aquatic resources in the Bay-Delta ecosystem.

ADOPTION AND IMPLEMENTATION

We propose that the Board adopt this Comprehensive Protection Program, including those elements that cannot be implemented under the Board's direct water rights and water quality authority. For those elements outside the Board's direct authority, we recommend that the Board use its considerable influence to cause implementation by those agencies with direct authority to implement.

This Comprehensive Protection Program must accomplish the following:

- Provide a long-range plan for the Bay-Delta system
- Provide for the early improvement in the fishery habitat to reverse the decline in native fishery resources

- Provide environmental protection sufficient to:
 - Eliminate the need for jeopardy opinions for operation of the state and federal water projects
 - Eliminate the need for listing of additional species for protection under the state and federal Endangered Species Acts
 - Ultimately, allow recovery of listed species and their subsequent de-listing.
- Accomplish these goals in a manner which causes the least possible water supply impact.

In developing this comprehensive program, the Board must include measures and incentives to ensure the full, equitable participation by all parties contributing to the decline in fishery resources as well as state and federal agencies that have a role in management of the Bay-Delta system.

As for implementation, some of the elements, particularly those in Category I, should be considered for implementation on a phased basis, with the state and federal water projects agreeing to meet their equitable share of the responsibility on an interim basis in early 1995, pending the results of water rights proceedings. Requirements similar to those in Category II are already in effect as part of D-1485 and the ESA requirements. Changes to those requirements in the comprehensive program would be implemented at the conclusion of the water rights proceeding by the Board.

We encourage vigorous action by the Board to implement Category III measures. Such action could include some forms of pollutant trading and mitigation credits to facilitate and make more equitable implementation of these measures.